

REMARKSClaim Amendments

Claim 13 is amended to correct a typographical error as proposed in the Official Action.

Claim Rejections - 35 USC §112

Applicants respectfully request withdrawal of the rejection of claims 1-13 under 35 USC §112, second paragraph.

The rejection is as follows:

“Claims 1-13 stand rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connection. See MPEP §2172.01. The omitted structural cooperative relationships are:

“In claims 1 and 7, the functional language ‘such that current flow through the photoconductive switch is dependent on any difference between voltage of the conductor and the applied voltage’ is unclear since there is no connectional structure (*sic*) between the conductor and the voltage applying circuit is (*sic*) recited in the body of claims so it is unclear where and how the difference between the voltage of conductor and the applied voltage is generated. It is also unclear where the current-to-voltage converter is connected in order to perform the function of converting the current flow to a voltage signal. The examiner assumes that the current-to voltage converter is connected to the photoconductive switch.”

The cited MPEP §2172.01 refers to rejection under 35 USC §112, second paragraph, of “... a claim which fails to interrelate essential elements of the invention as defined by applicant(s) in the specification.” (Emphasis added.)

It is respectfully submitted that the rejection is not well founded.

First, there are no essential elements of the invention as defined by the applicants in the specification, and the rejection does not identify any such essential elements. There is no basis for rejection under MPEP §2172.01.

Second, it is unclear what “connectional structure” is intended to mean. If “structural connection” is intended, it is unclear how this would apply to the operations recited in method claim 7.

Third, the use of functional language is not a ground for rejection under 35 USC §112, second paragraph::

“A fundamental principle contained in 35 U.S.C. 112, second paragraph is that applicants are their own lexicographers. They can define in the claims what they regard as their invention essentially in whatever terms they choose so long as the terms are not used in ways that are contrary to accepted meanings in the art.

Applicant may use functional language, alternative expressions, negative limitations, or any style of expression or format of claim which makes clear the boundaries of the subject matter for which protection is sought. As noted by the court in *In re Swinehart*, 439 F.2d 210, 160 USPQ 226 (CCPA 1971), a claim may not be rejected solely because of the type of language used to define the subject matter for which patent protection is sought, MPEP 2173.01 (emphasis added).

“There is nothing inherently wrong with defining some part of an invention in functional terms. Functional language does not, in and of itself, render a claim improper.” MPEP §2173.05(g) (emphasis added).

Fourth, the language of the rejection suggests a misperception of the claim language, as it appears to be based on an erroneous assumption that a voltage difference is somehow “generated.”

The language of claims 1 and 7 makes clear that electrical connectivity is established between the conductor to be probed and a first terminal of the photoconductive switch, and that during a sampling interval a laser pulse is applied to the photoconductive switch while a voltage is applied to the second terminal of the photoconductive switch, such that “current flow through the photoconductive switch is dependent on any difference between voltage of the conductor and the applied voltage.”

Claims 1 and 7 serve to particularly point out and distinctly claim the subject matter which Applicants regard as their invention, in the manner required by 35 USC §112, second paragraph.

Withdrawal of the rejection of claims 1-13 under 35 USC §112, second paragraph, is respectfully requested.

The objection to claim 13 is believed overcome by correction of the typographical error as proposed in the Official Action.

Claim Rejections - 35 USC §103

Applicants respectfully request withdrawal of the rejection of claims 1-13 under 35 USC §103.

The rejection states:

"Claims 1 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rajan et al ('005) in view of Sakai et al ('643).

"Rajan et al ('005) teach a method and a charge-particle-beam (*sic*) probe system (See Fig 11A) for probing voltage on a conductor on DUT as claimed, comprising:

- "a. establishing electrical connectivity between a conductor (1100) and a first terminal of photoconductive switch (1108) by a probe tip (see Col. 6, lines 28 "probe 12");
- "b. during a sampling interval n, applying a laser pulse (1105) (see Col. 6, lines 24-26) by a laser pulse (*sic*) (see Col. 12, "beam source"), while applying a voltage to a second terminal of the photoconductive switch by a circuit (see Col. 11, lines 66-67 "a predicted-voltage source");
- "d. (*sic*) passing a voltage signal during a gating interval T_{elec} by a gate (1130);
- "e. sampling the passed voltage signal to produce a voltage sample for the sampling interval n by a sampling circuit (see Col. 11, lines 3-4 "acquiring a voltage sample at a selected delay t").

"Rajan et al. ('005) do not teach the step of converting the current flow to a voltage signal by a current-to-voltage converter.

"Sakai et al ('643) disclose a scanning probe microscope for measuring the electrical properties of surface (*sic*) of an electrically conductive sample and expressly teach to provide a current-to-voltage converter in the system for converting a current flow from a photoconductive switch (301) to a voltage signal.

It would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to incorporate the teaching of Sakai et ('643)'s current-to-voltage converter into Rajan et al ('005)'s voltage sample probing system so that the electrical properties can be detected with high accuracy as disclosed by Sakai et al ('643) (see Col. 13, lines 3-4).

"It is noted that Rajan et al ('005)' (*sic*) probe system is a charge-particle-beam (*sic*) probe system and not a laser beam probe system. However, charge-particle-beam (*sic*) and Laser beam are functionally equivalent in semiconductor probe

measuring art. The substitution of equivalents requires no express motivation. In re Fount (*sic*, Fout) 213 USPQ 532 (CCPA 1982).

“With respect to claims 2 and 8, Rajan et al ('005) teach the steps of applying a repetitive test pattern to the conductor (1100) by a tester 14 and synchronizing the sampling interval with the repetitive test pattern appearing on the conductor (1100) by a timing circuit (30).

“With respect to claims 6 and 12, Rajan et al ('005) teach the steps of applying the voltage signal to an analog-to-digital converter (32) and enabling the analog-to-digital converter (32) to prepare a digital sample of the voltage signal representing voltage on the conductor.”

It is respectfully submitted that the rejection fails to make a *prima facie* case of obviousness and should, therefore, be withdrawn. Attention is directed to MPEP 706.02(j):

“To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure.* * *

“The initial burden is on the examiner to provide some suggestion of the desirability of doing what the inventor has done. ‘To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references.’”

The Official Action fails to establish a *prima facia* case of obviousness for multiple reasons.

First, the teaching of Rajan et al. is misrepresented in several respects. The rejection asserts that Rajan et al. teach establishing electrical connectivity between a conductor (1100) and a first terminal of photoconductive switch (1108) by a probe tip. In contrast to this assertion, Rajan et al. teach applying to a device under test (DUT) 1100 a pulsed beam 1105 of electrons from electro-optics 1108 of an electron beam probe system. **There is no photoconductive switch 1108 in Rajan et al. There is no “probe tip” in Rajan et al.** “Probe 12” of Rajan et al. is not a mechanical probe; it is instead an “electron beam test probe” of an electron beam test probe

system 10 (see Rajan et al. col. 1, lines 10-29) which directs electron beam pulses at a node of the DUT.

The rejection further asserts that Rajan et al. teach “applying a laser pulse (1105) ... by a laser pulse (*sic*) ..., while applying a voltage to a second terminal of the photoconductive switch... .” In contrast to this assertion, Rajan et al. teach applying a pulsed electron beam 1105 from electron optics 1108 of an electron probe 12 (Rajan et al. column 6, lines 24-26) while applying a predicted voltage Vfilter to a filter grid 1145 (Rajan et al. column 6, lines 40-42). **There is no laser pulse 1105 in Rajan et al. There is no photoconductive switch in Rajan et al. There is no second terminal of a photoconductive switch in Rajan et al.**

The rejection further asserts that Rajan et al. teach passing a voltage signal during a gating interval T_{elec} by a gate (1130). In contrast to this assertion, Rajan et al. teach a gated integrator 1130 which integrates an error signal (integrator current Iint) which depends on the difference between a secondary-electron current Isec and a reference current Iref from a constant-current source 1125. **There is no gate 1130 in Rajan et al. There is no voltage signal passed during a gating interval by a gate 1130 in Rajan et al.**

Second, the teaching of Sakai et al. is misrepresented. The rejection asserts that Sakai et al. disclose a scanning probe microscope for measuring the electrical properties of an electrically conductive sample and “expressly teach to provide a current-to-voltage converter in the system for converting a current flow from a photoconductive switch (301) to a voltage signal.” In contrast to this assertion, Sakai et al. teach a scanning tunneling spectroscopic microscope having a metallic probe 301 which is maintained at a fixed distance from the sample while a tunneling current is kept flowing between the probe and the sample. An I/V converter 311 converts the tunneling current flowing through the metallic probe 301 and outputs it as a tunneling current signal I_T (Sakai et al. column 3, lines 44-45 and 65-68). **There is no photoconductive switch 301 in Sakai et al.**

Third, the rejection points to no suggestion or motivation, either in the Rajan et al. or Sakai et al. references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the references or to combine reference teachings.

Fourth, the rejection offers no reason to believe there would be a reasonable expectation of success.

Fifth, the rejection fails to demonstrate that the Rajan et al. and/or Sakai et al. references, whether taken alone or in combination, teach or suggest all the claim limitations. To mention just one of many claim limitations, neither of these references is understood to teach or suggest the use of a photoconductive switch in a method or apparatus for probing voltage.

Sixth, the rejection fails to provide any suggestion of the desirability of doing what the applicants have done.

Seventh, the rejection states that the Rajan et al. probe system "is a charge-particle-beam (*sic*) probe system and not a laser beam probe system." While this statement appears to be correct on its face, it is understood to imply (incorrectly) that the applicants are claiming a system in which the probing is done by a laser beam. In contrast, the applicants disclose a contact tip 810 applied to conductor 805 of DUT 800; photoconductive switch 600 serves as a gate which is closed when pulsed with a laser beam.

Eighth, the rejection declares that "charge-particle-beam (*sic*) and Laser beam are functionally equivalent in semiconductor probe measuring art." No evidence is offered to support this contention. Attention is directed to MPEP §2144.06:

"* * * In order to rely on equivalence as a rationale supporting an obviousness rejection, the equivalency must be recognized in the prior art, and cannot be based on applicant's disclosure or the mere fact that the components at issue are functional or mechanical equivalents. * * *

(Emphasis added.)

The rejection offers no evidence of equivalence recognized in the prior art between an electron-beam probe system and a probe system employing a photoconductive switch to gate a signal. There are numerous differences which suggest that such an equivalence is unlikely to be found in the prior art, just two of which will be mentioned here. In a photoconductive switch the conducting electrons (or ions if the photoconductive switch is in the form of a gas-plasma-filled diode) come from the material of the switch. In an electron-beam probe system, the electrons come in the form of secondary-electron emission from the surface hit by the electron beam. A photoconductive switch conducts current in either direction when it is closed by an applied laser pulse. A secondary-emission scheme would only conduct in one direction, as the irradiated surface must be negative (a cathode) with respect to the electrode collecting the current (an anode).

Withdrawal of the rejection of claims 1-13 under 35 USC §103 is respectfully requested.

Allowable Subject Matter

The indication of allowable subject matter in claims 3-5 and 9-11 and the statement of reasons for allowability is gratefully acknowledged.

Additional reasons for allowability exist, only some of which are discussed herein, and each of which may be independently sufficient to establish the patentability of one or more pending claims. Applicants respectfully reserve the right to introduce, articulate, or otherwise comment upon any such additional reasons as may be appropriate in any future proceedings concerning the claimed invention.

September 2, 2003

Fee Authorization

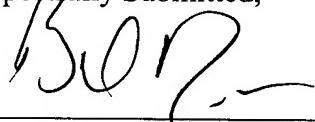
The Commissioner is hereby authorized to charge fees under 37 CFR §1.16 and §1.17 that may be required, or credit any overpayment, to deposit Account No. 19-0603, maintained in the name of NPTest, Inc. A duplicate of this paper is enclosed.

Conclusion

The application as amended is now believed to be in condition for allowance and such action is respectfully urged.

The Examiner is respectfully requested to contact the undersigned by telephone should there be any further issue preventing allowance.

Respectfully Submitted,



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September 2, 2003